IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Re:	Application of:	Jean Paul MARDON et al.
	Serial No.:	10/728,239
	Filed:	December 3, 2003
	For:	ALLOY AND TUBE FOR NUCLEAR FUEL ASSEMBLY AND METHOD FOR MAKING SAME
	Art Unit:	1793
	Examiner:	Jessee Randall Roe

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

February 20, 2009

APPELLANT'S BRIEF UNDER 37 C.F.R. § 41.37

Sir:

Appellant submits this brief for the consideration of the Board of Patent Appeals and Interferences (the "Board") in support of their appeal of the Final Rejection dated August 18, 2008 in this application. The statutory fee of $540.00 is submitted concurrently herewith. If any additional fees are deemed to be due at this time, the Assistant Commissioner is authorized to charge payment of the same to Deposit Account No. 50-0552.

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1. REAL PARTY IN INTEREST

The real party in interest is Framatome ANP, a French corporation having a place of business in Courbevoie, France and the assignee of record of the entire right, title and interest in the above-identified patent application.

2. RELATED APPEALS AND INTERFERENCES

Appellants, their legal representatives, and assignee are not aware of any appeal or interference that directly affects, will be directly affected by, or will have a bearing on the Board's decision in this appeal.

3. STATUS OF CLAIMS

Claims 1 to 7 are pending and were rejected in the Final Office Action dated August 18, 2008. Claim 1 was also been objected to in the Final Office Action.

The rejections to claims 1 to 7 thus are appealed. A copy of appealed claims 1 to 7 is attached hereto as Appendix A.

4. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the August 18, 2008 Final Office Action.

5. SUMMARY OF THE CLAIMED SUBJECT MATTER

Independent claim 1 recites a zirconium based alloy comprising a zirconium base (for example, page 1, line 18) and, by weight: Fe and at least one of the elements selected from the group consisting of Cr and V (for example, page 1, lines 19 to 20), a total of the contents in Fe and Cr + V being 200 to 700 ppm (for example, page 3, lines 23 to 24); 0.8% to 1.3% by weight of niobium (for example, page 1, lines 20 to 21); 1100 to 1700 ppm of oxygen (for example, page 1, line 21); less than 100 ppm of carbon (for example, page 1, line 21); 10 to 35 ppm of sulfur

(for example, page 1, lines 21 to 22); less than 50 ppm of silicon (for example, page 1, line 22) and; tin content exceeding zero and being 100 ppm or less in weight (for example, page 1, line 21).

Independent claim 2 recites a sheathing tube for one of a nuclear fuel rod and a guide tube for a nuclear fuel assembly, made from a zirconium based alloy (for example, page 1, line 27 to page 2, line 1) also containing, by weight, Fe and at least one of the elements selected from the group consisting of Cr and V, a total of the contents in Fe and Cr + V being 200 to 700 ppm (for example, page 2, lines 1 to 3); 0.8% to 1.3% by weight of niobium (for example, page 2, line 3), tin content exceeding zero and being 100 ppm or less (for example, page 2, line 3), 1100 to 1700 ppm of oxygen (for example, page 2, line 3), less than 100 ppm of carbon (for example, page 2, line 4), 10 to 35 ppm of sulfur (for example, page 2, line 4) and less than 50 ppm of silicon (for example, page 2, line 4), in the re-crystallized state, at least the greater part of the iron being in the form $Zr(Nb, Fe, Cr)_2$ or $Zr(Nb, Fe, V)_2$ and in which the intermetallic compounds are of a size not exceeding 200 nm (for example, page 2, lines 4 to 6).

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1 to 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,648,995 to Mardon et al. (hereinafter "Mardon") with evidence from "Zirconium Analysis by Production Control Quantometer" by Easterday (hereinafter "Easterday") in view of U.S. Patent No. 5,832,050 to Rebeyrolle et al. (hereinafter "Rebeyrolle"). Claims 1 and 2 have been rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 9 of U.S. Patent No. 6,863,745 to Charquet (hereinafter "Charquet").

7. ARGUMENTS

35 U.S.C. §103(a) Rejections

Claims 1 to 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over Mardon with evidence from Easterday in view of Rebeyrolle.

Mardon discloses a method of manufacturing a tube for a nuclear fuel assembly, and tubes obtained thereby. The invention provides "a method of manufacturing zirconium-based alloy tubes also containing 50 ppm to 250 ppm iron, 0.8% to 1.3% by weight niobium, less than 1600 ppm oxygen, less than 200 ppm carbon and less than 120 ppm silicon." (Col. 1, lines 46 to 50).

Easterday discloses "the use of a direct reading spectrograph for a point-to-plane analysis of zirconium." (Page 1867, paragraph 1, lines 1 to 3). "The Quantometer used was acquired for production control in the manufacturing of zirconium. The specification upon which it is designed covers the determination of aluminum, iron, cobalt, titanium, tin, vanadium, nickel, silicon, magnesium, manganese, boron, chromium, copper, cadmium, and calcium." (Page 1, col. 1, line 35 to col. 2, line 3).

Rebeyrolle discloses a zirconium based alloy, manufacturing process, and use in a nuclear reactor. "The alloy has a base composition similar to that of a zirconium alloy of known type used for the manufacture of an element intended for use in the core of a nuclear reactor, such as a cladding tube, a guide tube, or another structural element of a fuel assembly. In addition, the alloy contains sulphur in proportion by weight of between 8 and 100 ppm and preferably between 8 and 30 ppm." (See Abstract). Rebeyrolle states that "[i]n particular, the invention applies to a zirconium alloy containing by weight, from 0.3 to 0.7% of tin, from 0.3 to 0.7% of iron, from 0.1 to 0.4% of chromium, from 0.01 to 0.04% of nickel, from 70 to 120 ppm pf silicon and from 500 to 1800 ppm of oxygen." (Column 8, lines 46 to 50).

Claim 1 Argued Separately

Claim 1 recites "[a] zirconium based alloy comprising, by weight:

a zirconium base;

Fe and at least one of the elements selected from the group consisting of Cr and V, a total of the contents in Fe and Cr + V being 200 to 700 ppm;

0.8% to 1.3% by weight of niobium;

1100 to 1700 ppm of oxygen;

less than 100 ppm of carbon;

10 to 35 ppm of sulfur;

less than 50 ppm of silicon and;

tin content exceeding zero and being 100 ppm or less in weight."

The Office Action admits on page 3 that Mardon fails to teach or show the claim requirement of "10 to 35 ppm of sulfur," as required by claim 1. Although Rebeyrolle does disclose an alloy including sulfur, it is respectfully submitted that there is no teaching or motivation to combine the sulfur of Rebeyrolle with Mardon, and that one of ordinary skill in the art would not have found it obvious to combine the sulfur of Rebeyrolle with the Mardon alloys. In reference to Rebeyrolle, the sulfur is added to the alloy disclosed in Rebeyrolle to provide an improvement in creep and corrosion resistance and in the nodular-corrosion resistance. (See Rebeyrolle col. 2, line 66 to col. 3, line 5, for example). However, Mardon already addresses exactly these concerns by providing a lower iron level. Mardon clearly states "[i]t is important not to exceed a iron content of 250 ppm....high temperature creep drops off sharply when the iron content exceeds 250 ppm." (Col. 2, lines 10 to 14). Also, Mardon states "[t]ests showed generalized corrosion resistance in a high temperature aqueous medium representative of conditions in high pressure water reactor comparable to those of known Zr-Nb alloys having a high niobium content; they also showed hot creep strength much better than that of known alloys and very comparable to that of the best 'Zircaloy 4' alloys." (Col. 3, lines 27 to 33). The creep and corrosion resistance of Mardon are adequate without the sulfur, and thus, there is no reason that one of ordinary skill in the art would turn to Rebeyrolle and modify Mardon.

It is respectfully submitted that based on the clear disclosure to one of ordinary skill in the art by the Mardon and Rebeyrolle references, one of ordinary skill in the art would have found no need to add sulfur to Mardon, as Mardon's whole purpose is to address corrosion and creep resistance by maintaining low iron levels. Furthermore, it is respectfully submitted that the Examiner's proposed motivation at page 4, "in order to improve creep, uniform corrosion and nodular corrosion behaviors" as disclosed by Rebeyrolle would not be necessary in Mardon, as Mardon already teaches addressing these exact issues in another way. The Office Action asserts on page 8 that "Mardon is silent with respect to [sulfur content] due to the limiting of the iron content in the zirconium alloy." Clearly this teaches away from the use of sulfur in Mardon because Mardon provides an alternative solution. (See Mardon, col. 2, line 10: "It is important to not exceed a[n] iron content of 250 ppm"). Mardon has no reason to be modified for tripling the

creep resistance of Rebeyrolle as Mardon is concerned with improvements in creep and corrosion resistance while limiting iron content.

Finally, it is respectfully submitted that the zirconium sponge material quantities listed in Easterday are not representative of the zirconium found in Mardon, as Mardon has very low iron levels, and the combination of iron, chromium and vanadium in Easterday far exceeds the limits in Mardon. Moreover, the concentrations of these materials once the alloy has been made are not disclosed in Easterday. The Office Action asserts "that Mardon et al. ('995) does not specify removing impurities and therefore one of skill in the art would expect the presence of 20 to 50 ppm vanadium and 20 to 450 ppm chromium, as evidenced by Easterday." (Page 8). However, the Easterday disclosure is addressed to demonstrating the accuracy of a direct-reading spectrograph in analyzing zirconium samples. Easterday admits that the samples were manipulated to provide a wide concentration range for the elements listed in Table I. For example, Easterday states "[w]hen sufficient ranges of concentration were not available in the sponge, powdered material was blended with the sponge to give the desired concentration." (Page 1, col. 2, lines 35 to 39). Thus, based on the addition of material, one of ordinary skill in the art would not expect that the ranges disclosed in Easterday were typical of any zirconium alloy.

Because the Examiner has not articulated a proper reason to combine Mardon, Rebeyrolle and Easterday and because these reference should not be combined, reversal of the rejection of independent claim 1 and the related dependent claims 3, 4 and 6 under 35 U.S.C. §103(a) is respectfully requested.

Claim 2 Argued Separately

Claim 2 recites "a sheathing tube for one of a nuclear fuel rod and a guide tube for a nuclear fuel assembly, made from a zirconium based alloy also containing, by weight, Fe and at least one of the elements selected from the group consisting of Cr and V, a total of the contents in Fe and Cr + V being 200 to 700 ppm; 0.8% to 1.3% by weight of niobium, tin content exceeding zero and being 100 ppm or less, 1100 to 1700 ppm of oxygen, less than 100 ppm of carbon, 10 to 35 ppm of sulfur and less than 50 ppm of silicon, in the re-crystallized state, at least the greater

part of the iron being in the form $Zr(Nb, Fe, Cr)_2$ or $Zr(Nb, Fe, V)_2$ and in which the intermetallic compounds are of a size not exceeding 200 nm."

As discussed above, the Office Action admits on page 3 that Mardon fails to teach or show the claim requirement of "10 to 35 ppm of sulfur," as required by claim 2. Although Rebeyrolle does disclose an alloy including sulfur, it is respectfully submitted that there is no teaching or motivation to combine the sulfur of Rebeyrolle with Mardon, and that one of ordinary skill in the art would not have found it obvious to combine the sulfur of Rebeyrolle with the Mardon alloys. In reference to Rebeyrolle, the sulfur is added to the alloy disclosed in Rebeyrolle to provide an improvement in creep and corrosion resistance and in the nodular-corrosion resistance. (See Rebeyrolle col. 2, line 66 to col. 3, line 5, for example). However, Mardon already addresses exactly these concerns by providing a lower iron level. Mardon clearly states "[i]t is important not to exceed a iron content of 250 ppm....high temperature creep drops off sharply when the iron content exceeds 250 ppm." (Col. 2, lines 10 to 14). Also, Mardon states "[t]ests showed generalized corrosion resistance in a high temperature aqueous medium representative of conditions in high pressure water reactor comparable to those of known Zr-Nb alloys having a high niobium content; they also showed hot creep strength much better than that of known alloys and very comparable to that of the best 'Zircaloy 4' alloys." (Col. 3, lines 27 to 33). The creep and corrosion resistance of Mardon are adequate without the sulfur, and thus, there is no reason that one of ordinary skill in the art would turn to Rebeyrolle and modify Mardon.

It is respectfully submitted that based on the clear disclosure to one of ordinary skill in the art by the Mardon and Rebeyrolle references, one of ordinary skill in the art would have found no need to add sulfur to Mardon, as Mardon's whole purpose is to address corrosion and creep resistance by maintaining low iron levels. Furthermore, it is respectfully submitted that the Examiner's proposed motivation at page 4, "in order to improve creep, uniform corrosion and nodular corrosion behaviors" as disclosed by Rebeyrolle would not be necessary in Mardon, as Mardon already teaches addressing these exact issues in another way. The Office Action asserts on page 8 that "Mardon is silent with respect to [sulfur content] due to the limiting of the iron content in the zirconium alloy." Clearly this teaches away from the use of sulfur in Mardon because Mardon provides an alternative solution. (See Mardon, col. 2, line 10: "It is important to

not exceed a[n] iron content of 250 ppm"). Mardon has no reason to be modified for tripling the creep resistance of Rebeyrolle as Mardon is concerned with improvements in creep and corrosion resistance while limiting iron content.

Finally, it is respectfully submitted that the zirconium sponge material quantities listed in Easterday are not representative of the zirconium found in Mardon, as Mardon has very low iron levels, and the combination of iron, chromium and vanadium in Easterday far exceeds the limits in Mardon. Moreover, the concentrations of these materials once the alloy has been made are not disclosed in Easterday. The Office Action asserts "that Mardon et al. ('995) does not specify removing impurities and therefore one of skill in the art would expect the presence of 20 to 50 ppm vanadium and 20 to 450 ppm chromium, as evidenced by Easterday." (Page 8). However, the Easterday disclosure is addressed to demonstrating the accuracy of a direct-reading spectrograph in analyzing zirconium samples. Easterday admits that the samples were manipulated to provide a wide concentration range for the elements listed in Table I. For example, Easterday states "[w]hen sufficient ranges of concentration were not available in the sponge, powdered material was blended with the sponge to give the desired concentration." (Page 1, col. 2, lines 35 to 39). Thus, based on the addition of material, one of ordinary skill in the art would not expect that the ranges disclosed in Easterday were typical of any zirconium alloy.

Because the Examiner has not articulated a proper reason to combine Mardon, Rebeyrolle and Easterday and because these reference should not be combined, reversal of the rejection of independent claim 2 and the related dependent claims 5 and 7 under 35 U.S.C. §103(a) is respectfully requested.

Claims 4, 5 and 6 Argued Separately

With further respect to claims 4, 5 and 6 there is no expectation that if the iron content of Easterday is changed (as it would be by Mardon) that the Cr and Vanadium contents would remain the same. Easterday's concentrations are simply not applicable to the Mardon zirconium.

For this reason as well as the reason discussed with independent claims 1 and 2, reversal of the rejection to claim 4, 5 and 6 is respectfully requested.

Double Patenting

Claims 1 and 2 have been rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 9 of Charquet.

This obviousness-type double patenting rejection has been noted by the Applicant. A terminal disclaimer will be timely filed in accordance with 37 C.F.R. §1.321 in order to obviate this obviousness-type double patenting rejection if the pending claims are found otherwise allowable.

CONCLUSION

It is respectfully submitted that the application is in condition for allowance. Favorable consideration of this appeal brief is respectfully requested.

Respectfully submitted,
DAVIDSON, DAVIDSON & KAPPEL, LLC

DATED: February 20, 2009

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APPENDIX A:

PENDING CLAIMS 1 to 7 OF U.S.
APPLICATION SERIAL NO. 10/728,239

Claim 1 (previously presented): A zirconium based alloy comprising a zirconium base and, by weight:

Fe and at least one of the elements selected from the group consisting of Cr and V, a total of the contents in Fe and Cr + V being 200 to 700 ppm;

0.8% to 1.3% by weight of niobium;

1100 to 1700 ppm of oxygen;

less than 100 ppm of carbon;

10 to 35 ppm of sulfur;

less than 50 ppm of silicon and;

tin content exceeding zero and being 100 ppm or less in weight.

Claim 2 (previously presented): A sheathing tube for one of a nuclear fuel rod and a guide tube for a nuclear fuel assembly, made from a zirconium based alloy also containing, by weight, Fe and at least one of the elements selected from the group consisting of Cr and V, a total of the contents in Fe and Cr + V being 200 to 700 ppm; 0.8% to 1.3% by weight of niobium, tin content exceeding zero and being 100 ppm or less, 1100 to 1700 ppm of oxygen, less than 100 ppm of carbon, 10 to 35 ppm of sulfur and less than 50 ppm of silicon, in the re-crystallized state, at least the greater part of the iron being in the form $Zr(Nb, Fe, Cr)_2$ or $Zr(Nb, Fe, V)_2$ and in which the intermetallic compounds are of a size not exceeding 200 nm.

Claim 3 (original): A sheet of alloy as claimed in claim 1.

Claim 4 (previously presented): The zirconium based alloy of claim 1, wherein a ratio by weight of the Fe to the at least one of the elements selected from the group consisting of Cr and V is between 0.5 and 30.

Claim 5 (previously presented): The sheathing tube of claim 2, wherein a ratio by weight of the Fe to the at least one of the elements selected from the group consisting of Cr and V is between 0.5 and 30.

Claim 6 (previously presented): The sheet of claim 3, wherein a ratio by weight of the Fe to the at least one of the elements selected from the group consisting of Cr and V is between 0.5 and 30.

Claim 7 (previously presented): The sheathing tube of claim 2, wherein the intermetallic compounds are of a size exceeding 100nm.

APPENDIX B

Evidence Appendix under 37 C.F.R. §41.37(c)(ix):

No evidence pursuant to 37 C.F.R. §§1.130, 1.131 or 1.132 and relied upon in the appeal has been submitted by appellants or entered by the examiner.

APPENDIX C

Related proceedings appendix under 37 C.F.R. §41.37(c)(x):

As stated in "2. RELATED APPEALS AND INTERFERENCES" of this appeal brief, appellants, their legal representatives, and assignee are not aware of any appeal or interference that directly affects, will be directly affected by, or will have a bearing on the Board's decision in this appeal.